

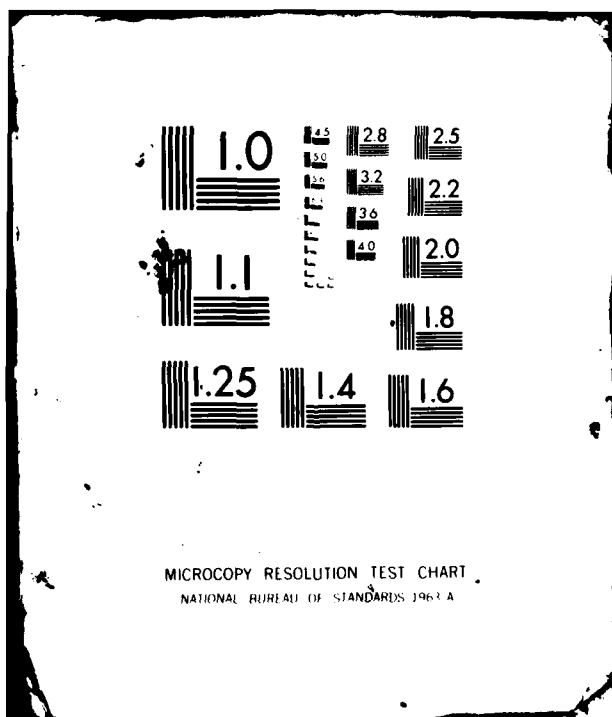
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CONCEPT DEFINITION FOR THE PEST MANAGEMENT COMPONENT OF THE POL--ETC(U)  
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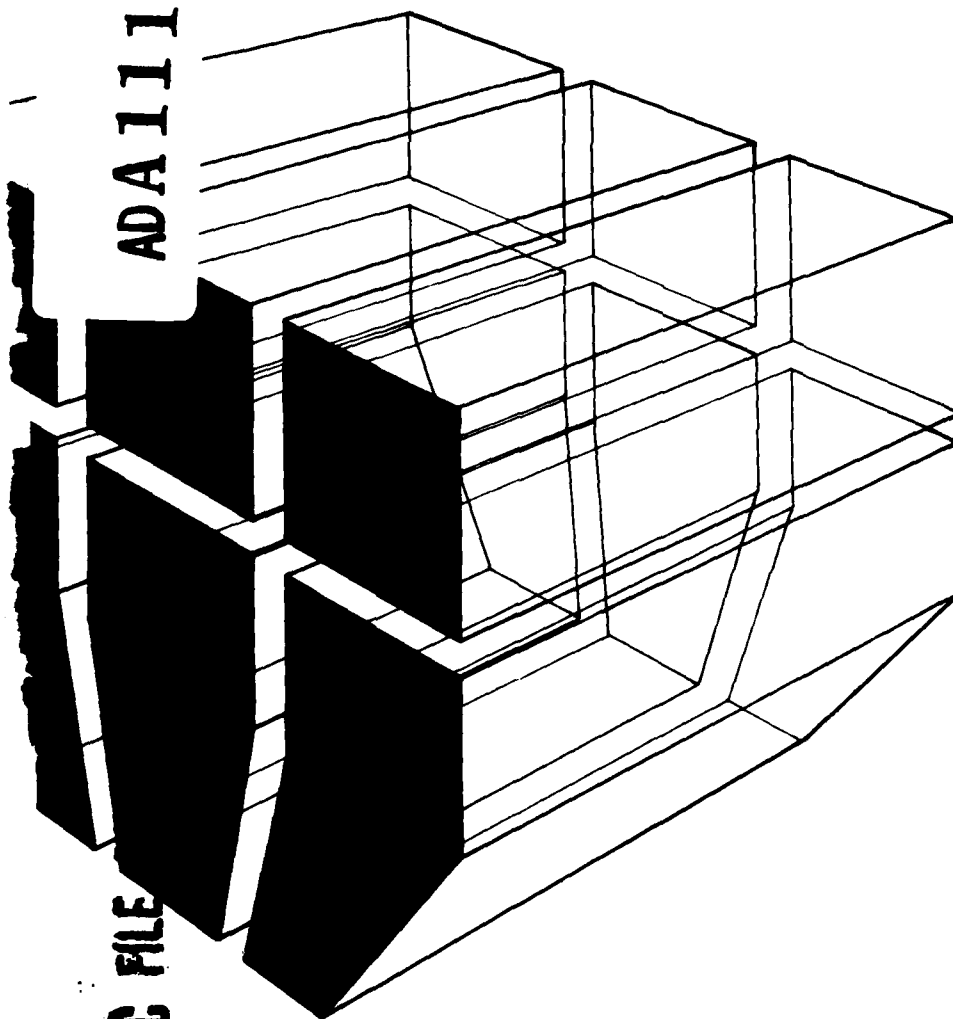
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Technical Report N-122  
January 1982

CONCEPT DEFINITION FOR THE PEST MANAGEMENT  
COMPONENT OF THE POLLUTION ABATEMENT  
MANAGEMENT SYSTEM (PAMS)

ADA 111 359



by  
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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>→ Army Major Command (MACOM) Professional Pest Management Personnel (MPPMP)<br>must maintain and manipulate large quantities of pest management data provided<br>to them by installations. Army Regulation 420-76, which covers this data col-<br>lection, implements Department of Defense (DOD) Directive 4150.7 -- the DOD<br>implementation of the Federal Insecticide, Fungicide, and Rodenticide Act as<br>amended (PL 92-516). The Environmental Management-by-Objectives (MBO) Report<br>and Defense Environmental Quality Program Policy Memoranda also require gath-<br>ering and summarizing pest management data. |                                  |                                                                                       |

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> To help MPPMP comply with these requirements, the U.S. Army Construction Engineering Research Laboratory has developed a pilot Pest Information Retrieval System component for its Pollution Abatement Management System (PAMS). This component will be an interactive computer system, accessible to users by telephone. A database built from installation-submitted DD 1532 reports will be manipulated by a powerful data retrieval and summarizing program. The formatted summary reports will be suitable for briefings or for written reports.

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## FOREWORD

This work was performed for the Directorate of Military Programs, Office of the Chief of Engineers (OCE). The research was conducted under RDT&E Project 4A762720A896, "Environmental Quality for Construction and Operation of Military Facilities"; Task T2, "Pollution Control Technology"; Work Unit 008, "Pollution Abatement Management System." LTC Dennis Gilson, DAEN-ZCE, was the OCE Technical Monitor. Mr. Ben Spencer of TRADOC provided advice and assistance.

This research was performed by the Environmental Division (EN), U.S. Army Construction Engineering Research Laboratory (CERL). Dr. R. K. Jain is Chief of EN.

COL Louis J. Circeo is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director.



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CONCEPT DEFINITION FOR THE PEST MANAGEMENT  
COMPONENT OF THE POLLUTION ABATEMENT  
MANAGEMENT SYSTEM (PAMS)

## 1 INTRODUCTION

### Background

Carrying out the Army's Pest Management Program involves preparing several types of reports, including: the monthly and annual reports required by Army Regulation (AR) 420-76; the pesticide application summaries required for the biannual Environmental Management-by-Objectives (MBO) Report; and information for responding to the irregularly issued Defense Environmental Quality Program Policy Memoranda (DEQPPM). The U.S. Army Construction Engineering Research Laboratory (CERL) has developed a pilot computer system that will make preparing these reports more accurate and less costly. This program, called the Pest Information Retrieval System, is a component of CERL's Pollution Abatement Management System (PAMS).<sup>1</sup> PAMS is designed to help Army pollution abatement planners/engineers manage facility pollution problems and define mitigation techniques. The interactive, computer-supported, data-based systems allow effective, economical management of large quantities of data in a form that is readily available, reliable, and centrally located.

### Objective

The objective of this study is to provide Army Major Command (MACOM) Professional Pest Management Personnel (MPPMP) with a system that will (1) help them comply with AR 420-76 and enable them to economically and accurately provide input to the Environmental MBO Report (RCS DD-M-(SA)1485), and (2) improve their response to DEQPPM.

### Approach

A pilot interactive computer system was initially developed for the U.S. Army Training and Doctrine Command (TRADOC) to perform keyword searches over a database created from installation Pest Control Reports (DD Form 1532) to provide summary reports.

Following successful experimental use, the system was expanded for eventual use throughout DOD as a component of PAMS. This expanded system will be able to summarize pest management data by use (e.g., by pesticide, installation, etc.). The U.S. Army Forces Command (FORSCOM), TRADOC, and the Defense Acquisition Readiness Command (DARCOM) are currently evaluating this newer version. The final system will reflect their input.

<sup>1</sup> R. D. Webster, E. D. Smith, V. Kothandaraman, Pollution Abatement Management System: Concept Definition, Technical Report N-42/ADA055565 (U.S. Army Construction Engineering Research Laboratory, 1978).

### Mode of Technology Transfer

The information in this report will be transferred in accordance with techniques for computer-assisted systems as defined in AR 18-1. The document implementing this system will be an appendix to AR 420-76 or DA PAM 420-76.

## 2 THE ARMY'S PEST MANAGEMENT PROGRAM

### General

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended by PL 92-516, regulates Army pest control operations. DOD Directive 4150.7 implements this law at the DOD level. AR 420-76 implements the directive for the Department of the Army (DA). At irregular intervals, DOD issues DEQPPM. When these memoranda affect pest management, AR 420-76 is changed to include their requirements.

The Pest Management Program, as set forth in AR 420-76, is part of the real property maintenance activities (RPMA) carried out at all DA installations and activities. All Army installations and activities in active use, held in an inactive or standby condition for future use, or classified in an excess category are subject to AR 420-76. Also covered are installations and activities, or portions of them, used by the National Guard, Army Reserve, or Reserve Officer Training Corps either full or part-time. Not included are Civil Works functions of the Corps of Engineers and facilities occupied by Army activities as tenants when real property control is under another military department or Government agency such as the General Services Administration.

The objectives of AR 420-76 (and, consequently, of the Army's Pesticide Management Program) are:

1. To develop, start, and maintain safe and effective pest control programs at each Army installation.
2. To maintain and protect the health, environmental quality, aesthetic values, and ecological balance of the military community by:
  - a. Protecting real estate investments from depreciation resulting from pests.
  - b. Complying with the environmental protection and improvement policies of AR 200-1.
  - c. Controlling potential disease vectors as necessary.
  - d. Preventing damage to natural resources by insects or other pests.
3. To retain and improve operating personnel competence and skill through periodic testing and training.
4. To prevent medical or economic pests from being introduced or spread into or throughout the United States, its territories, or possessions by Army operations.

## Pest Management Program Responsibilities

Responsibilities for the Army's Pest Management Program are divided among six classes of personnel: (1) MACOM commanders, (2) installation commanders, (3) Facilities Engineers, (4) Surgeon General, (5) building occupants, and (6) pest management coordinators.

MACOM commanders provide the technical supervision of the pest management program at their installations. They provide a professional staff to insure that all areas of pest management have expert direction. MPPMP serving on the MACOM's engineer staff (1) provide advice on all aspects of MACOM pest management, (2) coordinate with other agencies involved in pest control or environmental protection, (3) coordinate pest management activities with Army medical authorities, (4) review and provide written approval for use of nonstandard or state-registered pesticides, and (5) annually review on-site installation programs. MPPMP also maintain the training and certification records of pesticide applicators. They perform technical review of all contract pest management and of all military construction, modification, and repair projects involving structural pest control.

Installation commanders designate a pest management coordinator and approve and support the pest management program formulated for the installation by the Facilities Engineer and installation surgeon and approved by the MPPMP.

Installation Facilities Engineers develop a comprehensive written pest management plan for the installation, supervise and direct pest management operations, and conduct preventive maintenance and surveillance inspections. They also train personnel, obtain supplies, identify requirements for contract pest management work, and insure that this work meets specifications. Facilities Engineers maintain records of operations (e.g., investigations, inspections, manpower use, funds, and pesticides); especially significant for this research is the Facilities Engineer's responsibility for the recordkeeping and reporting requirements of AR 420-76.

The Surgeon General surveys pest populations affecting or with the potential to affect the health of personnel on military installations and those subject to U.S. Department of Agriculture quarantine regulations. The installation's medical authority conducts the pesticide monitoring program and establishes health and personnel safety criteria for pesticide operations. Medical personnel help conduct the annual on-site installation pest management reviews.

Building occupants are responsible for maintaining good sanitation, using only approved pesticides, and cooperating fully with installation pest control programs. Building occupants are expected to obtain, through command channels, MPPMP approval before using any contract pest control services.

The installation pest management coordinator must be aware of all pesticide applications on the installation and must insure that all pesticide applications are recorded and reported according to AR 420-76. He/she must also insure that all personnel responsible for pest management activities know AR 420-76 policies and procedures.

## AR 420-76 Records and Reporting Requirements

AR 420-76 requires that adequate records of all pest control activities be kept as a reference to help monitor and manage current programs. AR 420-76 requires two types of reports.

Installations use DD 1532 (Pest Control Report) to maintain daily records of pest management activities; some of the data recorded on this form is required for the installation's pest control report to its MACOM. These records must be saved for at least 2 years.

Each installation or subinstallation performing pest management submits DD 1532 monthly (or as required) to its MACOM. Copies are provided to the appropriate MPPMP (small MACOMs may sometimes use the staff of larger ones), to the installation doctor, and to USAEHA. The reports cover all pest control operations conducted by the Facilities Engineer, contractors, government-owned, contractor-operated (GOCO) activities, nonappropriated fund activities, and all outgrant lease holders.

Each installation prepares an annual report describing anticipated installation pest management programs or projects which meet one or more of the following criteria:

1. Use a restricted-use pesticide.
2. Use any pesticide that could reasonably be expected to significantly contaminate surface or ground water.
3. Treat 640 or more contiguous acres in one application.
4. Apply a pesticide by aircraft.
5. Affect endangered species.

Details required in the annual report include:

1. Objective of the program
2. Target pest
3. Pesticide
4. Application procedures
5. Description of the area
6. Sensitive areas or issues
7. Any remarks helpful in reviewing the program.

## Environmental Management-by-Objectives Report Data Requirements

The Environmental MBO Review (RCS DD-M(SA)-1485) requires that MACOMs and HQDA collect and provide certain pest management information to the Office of the Secretary of Defense (OSD). However, this RCS has expired and will soon be replaced. The proposed new RCS will request the following briefing data:

1. The number of installations receiving and the number not receiving annual, on-site, and professional pest management reviews for the past fiscal year; a comparison of these numbers with those of the last report; the number of installations which have comprehensive, documented pest management plans; the number of installations which require pest control operations and do not have comprehensive, documented plans.
2. The number of installations having the appropriate number of certified applicators in accordance with DEQPPM 80-10; the number of installations not in compliance with DEQPPM 80-10 certification; a description of steps to comply with DEQPPM 80-10.
3. For the past fiscal year, the number of pest control contracts released for bids and the number that professional pest management personnel have reviewed prior to solicitation and award.
4. The number of installations performing pest control operations and how many have total, partial, or no contracting of pest control functions; for the "total" and "partial" contracting categories, the number of installations which do not have DOD-certified personnel inspecting contract performance.
5. For in-house and contractual pest control services, the total pounds of active toxicant applied during the previous fiscal year for each of 15 listed\* pesticides; a separate graph showing the amount of these pesticides used annually, by weight, vs. year in which they were used since 1975 (or later, depending on availability of historical data on pesticide use). (This information will be used to evaluate impacts of suspending the use of certain pesticides at installations and to decide what would be the best replacement for a suspended pesticide.)
6. The number of installations with pesticide monitoring programs and the number with significant migration contamination problems; a comparison of these numbers with those of the last report.

## DEQPPM Requirements

DOD issues Defense Environmental Quality Program Policy memoranda periodically to respond to requests of the Deputy Assistant Secretary of Defense for Energy, Environment, and Safety. The subject of these requests may be any aspect of environmental quality at military facilities or associated with military programs or activities. As a result, DOD must be able to obtain

\* Aluminum phosphide, Bromacil, Carbaryl (Sevin), Chlordane, Chlorpyrifos (Dursban), Diazinon, Dichlorovos (DDVP), Malathion, Paraquat, Pentachlorophenol (PCP), Propoxur (Baygon), Thiram, strychnine/strychnine sulfate, zinc phosphide, and 2,4-D.

sufficient data to respond to these requests adequately and quickly. For example, the request might ask for how many pounds of the pesticide DDT were used on all Army installations between 1975 and 1980. DOD components must, therefore, be able to prepare an accurate response quickly.

### 3 DEVELOPMENT OF A PEST MANAGEMENT COMPONENT OF PAMS

#### Need for an Automated Management Tool

Every pest management operation on an installation is recorded on DD Form 1532. During 1980, TRADOC alone reported more than 5000 operations. Summarizing these records to prepare the reports described in Chapter 2 is time-consuming and expensive. When so many thousands of records are processed manually, errors of miscalculation or omission are inevitable.

When information not normally summarized is needed from the DD Form 1532 reports, there is currently no alternative to laboriously searching through the thousands of individual records. Responding to the irregularly issued and unpredictable DEQPPMs requires that MPPMP go through many years of pest management records.

An automated system for storing and retrieving DD Form 1532 should save time and minimize error. Once the records are stored in a computer database, they can be summarized instantly for report preparation and manipulated by a computer to extract previously uncompiled information such as that requested in DEQPPMs. The potential users of the system are MACOM pest management personnel, HQDA pest management administrators, and, indirectly, installation pest management personnel. The improved capabilities of the MPPMP to use the data provided to them by installations should enable MPPMP to give installation personnel better guidance.

#### History of the Pest Information Retrieval System

Development of an automated pest management system began in mid-1979. The initial work was performed under the sponsorship of the TRADOC Environmental Office. TRADOC wanted an automated system which would store all the information in Part I of DD Form 1532 in a computer database and then interactively retrieve these records as needed. The system developed for TRADOC was a very general system, easily usable by other Army commands or by other DOD components. However, a capability for summarizing usage by pest, pesticide, installation, type of terrain, type of operation, or supply source was also required. A pilot system meeting these specifications was developed during the next year. The operational version of this system (the Pest Information Retrieval System) will be a component of PAMS.

#### Experimental Use of the System

Since work on this system began, TRADOC has monitored the project's progress. In response to their comments and suggestions, many modifications of the originally conceived system were made. Now that the work is proceeding under PAMS, FORSCOM and DARCOM are providing similar experimental use and critiques of the developing system.



### Future Development

Future development of the system will involve: (1) provision for retrieving records by MACOM or service, (2) addition of more powerful summary and display commands, and (3) development of computerized procedures for detecting and correcting errors in the database. (Errors refer to mistakes made by installation personnel in filling out DD Form 1532. The computer should be able to quickly find most errors of this type and bring them to the attention of MPPMP for correction.)

#### 4 THE PILOT PEST INFORMATION RETRIEVAL SYSTEM\*

##### Definition

The pilot Pest Information Retrieval System is an interactive (or "conversational") computer system which runs on a Digital Equipment Corporation (DEC) VAX 11/780 minicomputer. Programs, tables, and database files residing under the UNIX operating system comprise the overall system.

The system facilitates interaction between the program and the user by prompting him/her to search the database. An advantage of such an interactive program is that the user can make mistakes without causing time-consuming delays; in most cases, the user can simply correct the mistake, with no effect on his/her session.

##### Data Fields

DD Form 1532 provides 17 types of information for each pesticide management operation. The information in each form is stored in a data field within the pilot system's database. The system will list these fields upon request:

|                |                                                          |
|----------------|----------------------------------------------------------|
| Command?       | show fields                                              |
| Pesticide Data | Field Names:                                             |
| accession      | "system identifier for the data from a single operation" |
| date           | "date operation was performed"                           |
| installation   |                                                          |
| pest           |                                                          |
| aori           | "A(adult) or I(immature)...not a searchable field"       |
| operation      | "name of operation performed"                            |
| units treated  | "units employed to express magnitude of operation"       |
| terrain        | "type of building or terrain treated"                    |
| pesticide      |                                                          |
| formulation    |                                                          |
| amount form    | "gallons, pounds, or ounces"                             |
| final conc     | "not a searchable field"                                 |
| rate lbs       | "not a searchable field"                                 |
| rate %         | "not a searchable field"                                 |
| snc            | "S, N, or C...not a searchable field"                    |

"S" indicates standard stock pesticides or materials procured from the Defense Logistics Agency. "N" refers to nonstandard materials procured either through open purchase or from the General Services Administration. If the supply source cannot be identified, it is entered as nonstandard. Pesticidal materials used by land-use permit holders or lessees are also reported as nonstandard. "C" indicates materials supplied by contractors.

man\_hrs "man hours...not a searchable field"

\* Indented text indicates actual computer output or instructions.

This is the time, in hours, devoted to all aspects of the control operation. This includes tasks such as inspections, preparation of pesticides, application, travel time, supervision, etc.

uic "installation identifier"

Some of these fields are searchable. The values for the searchable fields are as follows.

Command? show installation

carlisle barracks  
fort a. p. hill  
fort belvoir  
fort benjamin harrison  
fort benning  
fort bliss  
fort chaffee  
fort dix  
fort eustis  
fort gordon  
fort hamilton  
fort knox  
fort leavenworth  
fort lee  
fort leonard wood  
fort mcclellan  
fort pickett  
fort rucker  
fort sill  
usa support detachment

Command? show pest

algae  
allveg "all vegetation (soil sterilization)"  
ants  
aquaticwds "aquatic weeds other than algae"  
bats  
bdldweeds  
bedbugs "all these are standard abbreviations"  
beetlespp  
birds  
brgirdsec  
brush  
carpentant  
centipedes  
culicoids  
dampwdterm  
drywdterm  
earwigs  
fibfabpst

filthflies  
fireants  
fleas  
foodpests  
fungiwd  
grassyweed  
grdsqrls  
jpbeetles  
leafchewer  
lice  
marinebor  
mice  
mites  
mosquitoes  
mxbdlbrush  
mxgrabdlvd  
nematodes  
oldhousebr

ornp1ntdis  
 psychoda  
 rats  
 roaches  
 rodentsoth  
 rootpests  
 sapsuckers  
 scroplions  
 simuliids

slvrscid  
 snailslugs  
 spiders  
 stomoxys  
 subterms  
 tabanid  
 ticks  
 turfdis  
 urticating  
 wob

Command? show operation

atmosfum  
 barrier  
 chembar  
 clearing  
 dgair  
 dghand  
 dgpdeq  
 diptrlumb  
 ditching  
 engdinssur  
 exbait  
 exresidtr  
 extrap  
 fogging  
 gltreatmt  
 hydrafill  
 inbait  
 intrap  
 meddinssur  
 misting

omcontrol  
 palldipttr  
 plinstaltr  
 pileinpltr  
 poolinstaltr  
 poleinpltr  
 receptreat  
 residtr  
 sanitfill  
 soilfum  
 spair  
 spctr  
 sphand  
 sppdeq  
 stinpltr  
 strucfum  
 sursoiltr  
 systemapp  
 trlumbinst  
 trnsoiltr  
 vacuumfum

Command? show terrain

acf  
 brq  
 dew  
 exc  
 fhb  
 gfg  
 grh  
 hol

imp  
 ind  
 ken  
 ldf  
 mos  
 off  
 opb  
 opg

opx  
 rch  
 rec  
 res  
 rrc  
 sip  
 spw  
 tgc

tre  
 trv  
 ugs  
 utl  
 wat  
 waw  
 whs

Command? show pesticide

1080  
245t  
24d  
abate  
aldrin  
allethrin  
alumpos  
amitrole  
ammate  
anticoag  
arsenicorg  
aspon  
atrazine  
attractant  
avitrol  
bacthuring  
balan  
baygon  
bensulide  
bhc  
bnomyl  
bromacil  
cacn  
cadminate  
captan  
carbaryl  
cbisulfide  
chlordan  
chroneb  
clorbenzil  
coppersulf  
crboxide  
creosote  
cyclohexim  
daconil  
dalapon  
dchlorvos  
ddt  
daxon  
diazinon  
dicamba

dieldrin  
difolatan  
dimethoate  
dinitrocom  
dioxat  
diquat  
dithane  
diuron  
dsyston  
dursban  
duswetsulf  
dyrene  
endothall  
fenthion  
ferbam  
fnuron  
folpet  
hcn  
heptachlor  
herboil  
karathane  
kelthane  
kepone  
koban  
kromad  
ldarsenate  
limesulfur  
lindane  
m22  
malathion  
maneb  
mbc  
mbm  
mcb  
mcm  
mebromide  
mesurol  
metaldhyde  
milkyspore  
minoils

mirex  
miscoll  
mleichydra  
monuron  
mot  
mthoxychlor  
nacimollus  
naled  
napenta  
nicotine  
nonvpenta  
norbromide  
orepellent  
organsulf  
pegel  
pentawr  
picloram  
pon  
prisgreen  
prometone  
pyrethrum  
repellimt  
resmethrin  
ronnel  
rotenone  
rsquill  
silicaaero  
simzine  
slvex  
sodiumfid  
starlicide  
strychnine  
sul furyl fl  
tandex  
tbe  
tca  
thiram  
zectran  
zineb  
znph

Command? show formulation

bqt  
bts  
dus  
eml  
grn  
ifu  
odp

olp  
pog  
sfu  
sln  
sus

Command? show uic\*

W01569  
W01777  
W05170  
W13355  
W13777  
W18351  
W20491  
W21478  
W29997  
W2LPAA  
W34201  
W36352  
W39220  
W40801  
W42116  
W48083  
W51062  
W51281  
W51359  
W51459  
W51484

Command? show units treated

|     |                    |
|-----|--------------------|
| ac  | "acres"            |
| ea  | "each"             |
| mcf | "1000 cubic feet"  |
| mlf | "1000 lineal feet" |
| msf | "1000 square feet" |
| sy  | "square yards"     |

Command: show amount\_form

ga  
lb  
oz

\* UIC numbers are unique installation identifiers. For example W48083 is Fort Bliss. An installation may have more than one UIC code.

## Commands

The user may request a description of the commands available on the pilot system.

The following are commands in the Pest Information Retrieval System: "find", "and", "or", "except", "show", "list", "display", "summary", "help", "save", "restore", "quit", "end", and "bye".

To find out more about using a command, type "help <command name>," where <command name> is one of the words noted above.

Command? help find

The "find" command is used to search for values of searchable data fields.

"find <value>" - where <value> is the value of a searchable field - will locate all data records satisfying that <value>.

To get a list of searchable fields and <value>s - see the "show" command.

Command? help and

The "and" command is used to narrow the data records already found to those records which satisfy the new <value>. Thus,

"and <value>" - where <value> is the value of one of the searchable fields in the database. See "show" for how to get a list of <value>s.

Command? help or

The "or" command is used to expand the data records already found to include those data records in the database which satisfy the condition based on the <value> of the "or" command. Thus,

"or <value>" - where <value> refers to an actual value of a searchable field in the database. To get a list of fields and <value>s - see "show."

Command? help except

The "except" command is used to weed out the data records which have been found and which include <value>. Thus,

"except <value>" - will remove those records which have <value> from the list of those database records which have been found. <value> is the value of a searchable field in the database. For more information about fields and <value> - see "show."

Command? help show

The "show" command may be used in the following manner:

"show records" - will list all database record numbers which have been found.

"show fields" - will list all fields for the Pest Information Retrieval System by name.

"show <field name>" - where <field name> is a name returned by "show fields", will list all possible values of that field which may be in the database.

Command? help list

The "list" command may be used to list values from the data records on your terminal. Thus,

"list all" - will list all field values to the terminal.

"list <field name> <field name> etc"

where <field name> means one or more names of fields returned by "show fields", will print the values of those fields for found data records on your terminal.

Command? help display

The "display" command is used to get formatted output.

"display" - will print the output to your terminal.

"display <file name>" - where <file name> is the name of a file, will create an external file (outside of the Pest Information Retrieval System) which will contain the formatted output.



Command? help summary  
The "summary" command is not ready yet.

Command? help save  
The "save" command is used to save the results of a search in an external file, which may be retrieved later by using "restore". Thus,

"save <file name>" - where <file name> is a name of a file provided by you, will create an external file on disk with the contents of your present search. You may retrieve the file later (even another session) by using the "restore" command.

Command? help restore  
The "restore" command is used to retrieve from a disk a file which you have created by having used the "save" command. Thus,

"restore <file name>" - where <file name> is the name of the file you used with "save <file name>", will give you the results of that search.

Command? help quit  
The commands, "end", "quit", and "bye" may all be used to exit the Pest Information Retrieval System and terminate your session.

### Sample Output

Following is a sample run of the pilot system. The numbers which appear on the left of "list" output items are arbitrarily assigned accession numbers.

Welcome to the Pest Information Retrieval System

For help, type "help"

WAIT a second I'm thinking  
2771 pesticide records in current list

Command? find fort bliss

"select all records in the database  
which apply to Fort Bliss"

53 found

Command? list pest

"for each record just found, show  
the pest involved"

|      | pest       |
|------|------------|
| 50:  | roaches    |
| 51:  | roaches    |
| 52:  | roaches    |
| 53:  | roaches    |
| 54:  | roaches    |
| 55:  | roaches    |
| 56:  | lice       |
| 57:  | ants       |
| 58:  | ants       |
| 59:  | foodpests  |
| 60:  | mice       |
| 61:  | otpskunk   |
| 62:  | otpcat     |
| 63:  | ticks      |
| 409: | roaches    |
| 410: | roaches    |
| 411: | roaches    |
| 412: | roaches    |
| 413: | roaches    |
| 414: | roaches    |
| 415: | filthflies |
| 416: | lice       |
| 417: | wob        |
| 418: | ants       |
| 419: | ants       |
| 420: | foodpests  |
| 421: | mice       |
| 422: | otpskunks  |
| 423: | otpcats    |
| 424: | spiders    |
| 425: | ticks      |
| 648: | roaches    |
| 649: | roaches    |
| 650: | roaches    |
| 651: | roaches    |
| 652: | roaches    |
| 653: | roaches    |
| 654: | filthflies |
| 655: | filthflies |
| 656: | filthflies |
| 657: | lice       |
| 658: | wob        |
| 659: | ants       |
| 660: | ants       |
| 661: | foodpests  |

662: mice  
 663: otpskunks  
 664: otpcats  
 665: spiders  
 666: ticks  
 667: birdpidgeons  
 668: othmoths  
 669: mxgrabdlvd

Command? and ants

"find all Fort Bliss records which  
 involve ants"

194 found  
 6 in current list

Command? list pesticide

"list the pesticides which were  
 used against ants at Fort Bliss"

pesticide  
 57: chlordane  
 58: chlordane  
 418: chlordane  
 419: chlordane  
 659: chlordane  
 660: chlordane

Command? display

"provide formatted information  
 about the selected records"

| INSTALLATION | PEST | OPERATION | TERR | PESTICIDE | FORM | AMOUNT |
|--------------|------|-----------|------|-----------|------|--------|
| fort bliss   | ants | sphand    | opg  | chlordane | eml  | 5 ga   |
| fort bliss   | ants | exresidtr | res  | chlordane | eml  | 10 ga  |
| fort bliss   | ants | sphand    | opg  | chlordane | eml  | 10 ga  |
| fort bliss   | ants | exresidtr | res  | chlordane | eml  | 11 ga  |
| fort bliss   | ants | sphand    | opg  | chlordane | eml  | 20 ga  |
| fort bliss   | ants | exresidtr | res  | chlordane | eml  | 36 ga  |

Command? find chlordane

"find all records describing an  
 application of the pesticide  
 chlordane in the database"

37 found

Command? and eml

"select from these chlordane records  
those in which the pesticide was  
applied in an emulsion"

411 found  
34 in current list

Command? list pest

"list the pests against which an  
emulsion of chlordane was applied"

|      | pest      |
|------|-----------|
| 22:  | sub terms |
| 57:  | ants      |
| 58:  | ants      |
| 92:  | sub terms |
| 254: | sub terms |
| 380: | sub terms |
| 381: | sub terms |
| 358: | sub terms |
| 399: | sub terms |
| 418: | ants      |
| 419: | ants      |
| 473: | sub terms |
| 474: | sub terms |
| 518: | sub terms |
| 584: | sub terms |
| 585: | sub terms |
| 631: | sub terms |
| 632: | sub terms |
| 633: | sub terms |
| 634: | sub terms |
| 659: | ants      |
| 660: | ants      |
| 695: | sub terms |
| 696: | sub terms |
| 710: | sub terms |
| 713: | sub terms |
| 744: | sub terms |
| 841: | sub terms |
| 842: | sub terms |
| 864: | sub terms |
| 865: | sub terms |
| 883: | sub terms |
| 884: | sub terms |
| 964: | sub terms |

Command? except ants

"delete those records involving  
ants from the currently selected  
list"

194 found  
28 in current list

Command? display

| INSTALLATION           | PEST     | OPERATION TERR | PESTICIDE | FORM | AMOUNT  |
|------------------------|----------|----------------|-----------|------|---------|
| fort belvoir           | subterms | sursoiltr res  | chlordan  | eml  | 22262 g |
| fort chaffee           | subterms | sursoiltr whs  | chlordan  | eml  | 200 ga  |
| usa support detachment | subterms | sursoiltr ind  | chlordan  | eml  | 25 ga   |
| fort belvoir           | subterms | sursoiltr res  | chlordan  | eml  | 100 ga  |
| fort belvoir           | subterms | sursoiltr off  | chlordan  | eml  | 200 ga  |
| fort benning           | subterms | subsoiltr res  | chlordan  | eml  | 155 ga  |
| fort benning           | subterms | sursoiltr whs  | chlordan  | eml  | 205 ga  |
| fort chaffee           | subterms | sursoiltr whs  | chlordan  | eml  | 300 ga  |
| fort chaffee           | subterms | trnsoiltr whs  | chlordan  | eml  | 100 ga  |
| fort eustis            | subterms | sursoiltr res  | chlordan  | eml  | 50 ga   |
| fort belvoir           | subterms | sursoiltr res  | chlordan  | eml  | 100 ga  |
| fort belvoir           | subterms | sursoiltr off  | chlordan  | eml  | 800 ga  |
| fort benning           | subterms | subsoiltr res  | chlordan  | eml  | 224 ga  |
| fort benning           | subterms | subsoiltr off  | chlordan  | eml  | 208 ga  |
| fort benning           | subterms | subsoiltr ind  | chlordan  | eml  | 230 ga  |

| INSTALLATION      | PEST     | OPERATION TERR | PESTICIDE | FORM | AMOUNT  |
|-------------------|----------|----------------|-----------|------|---------|
| fort benning      | subterms | subsoiltr off  | chlordan  | eml  | 46 ga   |
| carlisle barracks | subterms | trnsoiltr off  | chlordan  | eml  | 52 ga   |
| carlisle barracks | subterms | trnsoiltr res  | chlordan  | eml  | 24 ga   |
| fort chaffee      | subterms | trnsoiltr whs  | chlordan  | eml  | 200 ga  |
| fort chaffee      | subterms | sursoiltr whs  | chlordan  | eml  | 300 ga  |
| fort eustis       | subterms | sursoiltr res  | chlordan  | eml  | 100 ga  |
| fort a.p. hill    | subterms | sursoiltr brq  | chlordan  | eml  | 450 ga  |
| fort a.p. hill    | subterms | sursoiltr off  | chlordan  | eml  | 150 ga  |
| fort jackson      | subterms | trnsoiltr res  | chlordan  | eml  | 250 ga  |
| fort jackson      | subterms | trnsoiltr utl  | chlordan  | eml  | 3884 ga |
| fort knox         | subterms | sursoiltr off  | chlordan  | eml  | 450 ga  |
| fort knox         | subterms | sursoiltr res  | chlordan  | eml  | 1965 ga |
| fort mcellean     | subterms | sursoiltr res  | chlordan  | eml  | 450 ga  |

Command? find diazinon

"find all records in the database  
of applications of diazinon"

634 found

Command? summary

"performing any necessary conversions  
first, add up the total amount of  
diazinon applied on the selected  
records. List any errors in the  
data found"

ILLEGAL value #9 in access 2783  
ILLEGAL value #9 in access 3288  
ILLEGAL value #9 in access 3324  
ILLEGAL value #9 in access 3442  
ILLEGAL value #9 in access 3598  
ILLEGAL value #9 in access 4144

Pounds of Active Ingredient: 1568.08

24 ERRORS in 634 RECORDS

Command? display myfile

"display the entire contents of each  
record in the current list to a  
formal external file which the user  
could give any desired name. The  
output from this command is for-  
matted for 132 column output."

Command? quit  
Good-bye from PEST

\$ cat myfile

"This command will print myfile  
on a 132 column printer"

## 5 CONCLUSIONS

This report has described the pilot Pest Information Retrieval System component of PAMS. This system will automate storage and retrieval of pest management program data for reports required under AR 420-76, the Environmental Management-by-Objectives Report, and Defense Environmental Quality Program Policy Memoranda. The automated system will minimize the chance of errors caused by miscalculation and manual handling of data. By eliminating the need for manual manipulation of data, the system will reduce the amount of time pest management personnel spend collecting and thus make the process much less expensive.

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